

WHAT IS CLAIMED IS:

- 1 1. A method of extracting from an input image a graphical bar code
2 containing graphically encoded information, comprising:
3 matching to the input image a document template selected from a set of
4 document templates each having a respective predetermined page layout
5 corresponding to a respective document type and including a predetermined
6 graphical bar code location; and
7 cropping the input image based on information relating to the graphical bar
8 code location in the page layout of the document template matched to the input
9 image to produce a cropped graphical bar code candidate for decoding.
- 1 2. The method of claim 1, wherein matching comprises sub-sampling
2 the input image to generate a reduced-resolution thumbnail of the input image.
- 1 3. The method of claim 2, wherein matching comprises binarizing the
2 thumbnail of the input image.
- 1 4. The method of claim 3, wherein the thumbnail of the input image is
2 binarized in accordance with an image-dependent thresholding process.
- 1 5. The method of claim 4, wherein the target image is binarized in
2 accordance with Kittler-Illingworth thresholding process.
- 1 6. The method of claim 3, wherein matching comprises matching the
2 binarized thumbnail of the input image to binary images representative of
3 document templates.
- 1 7. The method of claim 6, wherein each document template in the set
2 is represented by multiple binary images each representing a different orientation
3 of the corresponding document template, and the binarized thumbnail of the
4 input image is matched to each of the binary images representative of each of the
5 document templates.

1 8. The method of claim 6, wherein matching comprises computing
2 respective measures of similarity between the binarized thumbnail of the input
3 image and the binary images representative of document templates.

1 9. The method of claim 8, wherein matching comprises identifying a
2 candidate document template determined mostly likely to match the input image
3 based on the computed similarity measures.

1 10. The method of claim 9, wherein the candidate document template is
2 selected as the matching document template based on a comparison of a
3 threshold to the computed measure of similarity between the binarized thumbnail
4 of the input image and the binary image representative of the candidate document
5 template.

1 11. The method of claim 8, wherein similarity measures are computed
2 by convolving matched filters generated based on each of the binarized sub-
3 sampled images representative of document templates with the binarized
4 thumbnail of the input image.

1 12. The method of claim 6, wherein cropping the input image comprises
2 mapping position coordinates of a graphical bar code location in an image
3 corresponding to the binary image matched to the thumbnail of the input image to
4 position coordinates in the input image.

1 13. The method of claim 1, wherein matching comprises identifying the
2 document type and orientation of the selected document template.

1 14. The method of claim 1, wherein each document template in the set
2 is represented by multiple corresponding representative images.

1 15. The method of claim 14, wherein each of the multiple images
2 represents a different orientation of the corresponding document template.

1 16. The method of claim 1, wherein the graphical bar code corresponds
2 to a base image modulated with a graphical encoding of information.

1 17. The method of claim 1, further comprising acquiring sample images
2 representative of respective document templates in the set.

1 18. The method of claim 17, further comprising sub-sampling images
2 representative document templates to generate a respective reduced-resolution
3 thumbnail of the sample images.

1 19. The method of claim 18, further comprising binarizing the
2 thumbnails of the sample images.

1 20. The method of claim 19, further comprising generating from each
2 sample image multiple binarized thumbnails corresponding to different respective
3 orientations of the corresponding document template.

1 21. A system for extracting from an input image a graphical bar code
2 containing graphically encoded information, comprising:
3 a document template matching module operable to match to the input
4 image a document template selected from a set of document templates each
5 having a respective predetermined page layout corresponding to a respective
6 document type and including a predetermined graphical bar code location; and
7 a cropping module operable to crop the input image based on information
8 relating to the graphical bar code location in the page layout of the document
9 template matched to the input image to produce a cropped graphical bar code
10 candidate for decoding.

1 22. The system of claim 21, wherein the document template matching
2 module is operable to sub-sample the input image to generate a reduced-
3 resolution thumbnail of the input image.

1 23. The system of claim 22, wherein the document template matching
2 module is operable to binarize the thumbnail of the input image.

1 24. The system of claim 23, wherein the thumbnail of the input image is
2 binarized in accordance with an image-dependent thresholding process.

1 25. The system of claim 23, wherein the document template matching
2 module is operable to match the binarized thumbnail of the input image to binary
3 images representative of document templates.

1 26. The system of claim 25, wherein the document template matching
2 module is operable to compute respective measures of similarity between the
3 binarized thumbnail of the input image and the binary images representative of
4 document templates.

1 27. The system of claim 26, wherein the document template matching
2 module is operable to identify a candidate document template determined mostly
3 likely to match the input image based on the computed similarity measures.

1 28. The system of claim 27, wherein the candidate document template
2 is selected as the matching document template based on a comparison of a
3 threshold to the computed measure of similarity between the binarized thumbnail
4 of the input image and the binary image representative of the candidate document
5 template.

1 29. The system of claim 26, wherein similarity measures are computed
2 by convolving matched filters generated based on each of the binary images
3 representative of document templates with the binarized thumbnail of the input
4 image.

1 30. The system of claim 25, wherein the cropping module is operable to
2 map position coordinates of a graphical bar code location in an image
3 corresponding to the binary image matched to the thumbnail of the input image to
4 position coordinates in the input image.

1 31. A computer program for extracting from an input image a graphical
2 bar code containing graphically encoded information, the computer program
3 residing on a computer-readable medium and comprising computer-readable
4 instructions for causing a computer to:

5 match to the input image a document template selected from a set of
6 document templates each having a respective predetermined page layout

7 corresponding to a respective document type and including a predetermined
8 graphical bar code location; and
9 crop the input image based on information relating to the graphical bar
10 code location in the page layout of the document template matched to the input
11 image to produce a cropped graphical bar code candidate for decoding.